

Giovanni News

Editor's Note:

While there has not been an issue of *The Giovanni News* for a couple of months, Giovanni development has not been idle. The GES DISC officially retired the Giovanni-3 system at the end of March, transferring all data to, and focusing all Giovanni development on, Giovanni-4. Data sets are regularly being added to the system, along with new analytical capabilities. As Giovanni-4 matures, the use of the system continues to increase, evidenced by the increasing annual number of publications on research using Giovanni. So, we look forward with a description of Giovanni 4.19, and we look backward with a review of four 2015 papers that referenced Giovanni. We also have a couple of other items of interest. Hopefully, something for everyone!

**James Acker, *The Giovanni News*
Editor**

Giovanni 4.19 is released

There is a lot of good news for Giovanni users in Giovanni 4.19! The awaited and much-anticipated ocean color data are now available (with many more data products to be added soon). Also, another capability that has been requested frequently, time-series with statistics, is a major part of this release.

For the aspiring movie director who resides in all of us, the images that make up an animation can now be downloaded as a zip file. The downloaded file allows data scientist Spielbergs and Coppolas to use software of their choosing to make high-quality animations with Giovanni data maps.

In addition to the five MODIS-Aqua ocean color data variables, here are other data variables that have recently been added to the system:

- Additional FLDAS_VIC025 variables (total of 138 variables)
- AQUARIUS_L3_SSS_CAP_MONTHLY variables (total of 2 variables)
- GRACEDADM_CLSM025NA **Version 1** variables (total of 3 variables)
- MODIS collection 6 daily and monthly variables (total of 104 variables)
- NLDAS_FORA0125 monthly climatology variables (total of 10 variables)

Four selected publications from the second half of 2015

There were more papers published in 2015 on research that used Giovanni than were published in any previous year. We are obviously pleased to see the system and the data in it being used in many diverse ways. Summaries of four interesting papers appearing in the July-December 2015 period demonstrate the variety of research topics to which Giovanni contributes.

Langone, L., Conese, I., Miserocchi, S., Boldrin, A., Bonaldo, D., Carniel, S., Chiggiato, J., Turchetto, M., Borghini, M., and Tesi, T. (2015) Dynamics of particles along the western margin of the Southern Adriatic: processes involved in transferring particulate matter to the deep basin. *Marine Geology*, available online 9 September, 16 pages, doi:10.1016/j.margeo.2015.09.004.

In this paper, Leonardo Langone and collaborators from CNR-ISMAR in Bologna, Italy investigated the processes that move water carrying particulate matter from the shallow shelf of the Adriatic Sea to the depths of the adjacent basin. A primary process causing this transport is dense shelf water (DSW) cascading. DSW forms when the Adriatic Sea shelf waters are saline and temperatures decrease. Hence, mild winters with higher rainfall are not favorable to DSW formation, as fresh water river outflow and warmer temperatures do not create dense water conditions. In contrast, cold winter conditions do favor DSW formation. A cold snap in the winter of 2012 caused enhanced formation of DSW, which was investigated with *in situ* instrumentation array deployments. DSW cascading caused particulate matter concentrations, predominantly inorganic in composition, to be approximately five times higher in the deep basin during winter 2012 than in the previous three mild winters. Other processes which transport particles, when DSW cascading is not the dominant process, were also investigated. 8-day chlorophyll concentration data from MODIS, visualized with Giovanni, were utilized to examine surface conditions from February 2 to June 9, 2012, showing changes in the coastal area and river outflows.

Basha, G., Phanikumar, D.V., Kumar, N., Ouarda, T.B.M.J., and Marpua, P.R. (2015) Investigation of aerosol optical, physical, and radiative characteristics of a severe dust storm observed over UAE. *Remote Sensing of Environment*, 169, 404–417, doi:10.1016/j.rse.2015.08.033.

2012 was an active year for weather in the Mediterranean region and the Middle East. While Langone et al. were investigating particle transport in the Adriatic due to the cold winter conditions, dust storms were being triggered over the Arabian Peninsula. Whereas Langone et al. investigated particle transport in the Adriatic due to the cold winter conditions, Basha et al. investigated the triggering of dust storms over the Arabian Peninsula. A massive dust storm broke out in March 2012, covering a large area of the peninsula on March 18. The dust storm originated in eastern Saudi Arabia and the Rub' Al Khali (the "Empty Quarter") and migrated westward over the United Arab Emirates and Persian Gulf. It eventually traveled into Iran, Afghanistan, and Pakistan, before turning southward over western Oman and the Arabian Sea on March 20. The researchers examined both the meteorological origins and meteorological impact of this dust storm, noting strong temperature drops occurring with the passage of the storm. The aerosol properties of the dust in the storm were analyzed with the use of AERONET data. The spatial variation of the dust aerosol was mapped daily from March 17-22 with Giovanni, using MODIS Deep Blue and OMI Aerosol Index data. The research team was led by Ghouse Basha of the Institute Center for Water and Environment (iWATER), Masdar Institute of Science and Technology, Abu Dhabi, UAE.

Mutai, B.K., Muthama, J.N., Ng'ang'a, J.K., and Ngaina, J.N. (2015) Analysis of the temporal evolution of total column nitrogen dioxide and ozone over Nairobi, Kenya using daily OMI measurements. *Ethiopian Journal of Environmental Studies and Management*, 8(5), 530–540, doi:10.4314/ejesm.v8i5.6.

The air quality of large cities such as Nairobi, Kenya is an important consideration for public health. In this paper, B.K. Mutai and his fellow researchers looked at two primary atmospheric components related to air quality, ozone (O₃) and nitrogen dioxide (NO₂). They found that both of these components varied seasonally, with elevated NO₂ leading to elevated O₃ concentrations. In Nairobi, the wet season occurs during March and May, and the dry season between December and February. The peak of NO₂ and O₃ occurs in September, between the seasons. Daily NO₂ and O₃ data acquired from Giovanni were the primary data variables used for this investigation.

Lamchin, M., Lee, J.-Y., Lee, W.-Y., Lee, E.J., Kim, M., Lim, C.-H., Choi, H.-A., and Kim, S.-R. (2015) Assessment of land cover change and desertification using remote sensing technology in a local region of Mongolia. *Advances in Space Research*, doi:10.1016/j.asr.2015.10.006, available online October 14, 2015, 14 pages.

Desertification refers to the process where land areas adjacent to deserts become increasingly arid and denuded of vegetation. The process can be natural or can be exacerbated by human activities. Desertification is a human and ecological concern, because it generally causes reductions in biological and agricultural productivity. In this paper, Munkhnasan Lamchin and his co-authors examined desertification in the Hognu Khaan nature reserve, which, according to the paper, “shares the boundaries of three different geographic regions in Mongolia.” One characteristic of the Hognu Khaan reserve is a large aeolian sand dune running along much of the western boundary of the region.

Giovanni was used to show the seasonal ranges of temperature and rainfall for this area, over the period 1998-2014 for rainfall and 2003-2014 for air temperature. Both variables displayed a strongly seasonal pattern. Indicators of desertification were analyzed with Landsat data. During the period 1990-2002, there was a significant increase in areas classed as “high” or “severe” desertification.” For the period 2002-2011, areas of “severe” desertification increased substantially.

**If you need a new way to look
at the world,**

NASA's Giovanni can help.

Sea cucumbers in *Grist*, researched with Giovanni

Sea cucumbers (known scientifically as *holothurians*) are certainly not the most glamorous or beautiful of the ocean's myriad creatures. But they perform a vital ocean cleaning function. Because of that function and because they are also harvested as seafood delicacies (which I admit is not something I would contemplate wanting on my plate), they are also subjects of research. Recent research into influences on their population genetic diversity has indicated concerns about the health of their populations near Japan. This research used Giovanni to assess regional oceanographic conditions.

A recent article published by grist.org highlighted the research paper that examined the genetic diversity of the population of *Holothuria edulis* sea cucumbers off the coast of Japan. The paper describing the research was published in *Conservation Genetics*. The full citation is as follows:

- Soliman, T., Fernandez-Silva, I., and Reimer, J.D. (2016) Genetic population structure and low genetic diversity in the over-exploited sea cucumber *Holothuria edulis* Lesson, 1830 (Echinodermata: Holothuroidea) in Okinawa Island. *Conservation Genetics*, 11 pages, doi:10.1007/s10592-016-0823-8.

Here's the link to the *Grist* article:

[Sea cucumbers vacuum up the ocean's trash, and they're in trouble.](#)

Partly as indicators of water quality and nutrient levels, phytoplankton productivity and colored dissolved organic matter (CDOM) in the region are potentially related to the sea cucumber population. Giovanni was used to examine both of these variables over the period 2002-2014. The primary conclusion of the research was that the population in waters affected by lower water quality and pollution (on the eastern side of the island) had less genetic diversity than that of the population on the less-developed western side.

As the *Grist* article notes, this particular type of sea cucumber is referred to as the “burnt hot dog” sea cucumber. The two pictures of *Holothuria edulis* shown here indicate why that designation is appropriate.



Holothuria edulis
in 2014

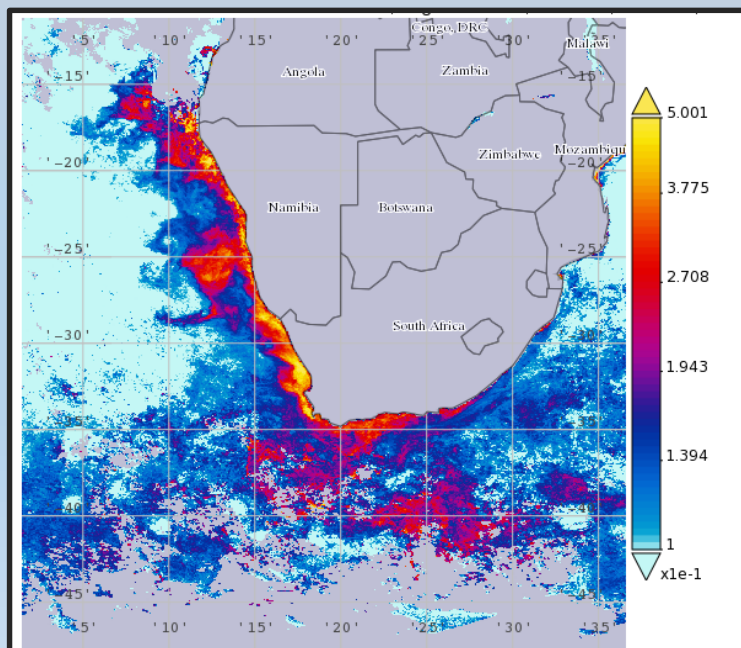
Why we like this color palette

One of the most familiar color palettes used to map many different kinds of geophysical data is the so-called “rainbow” palette. In the rainbow palette, the colors of the rainbow indicate values of the data variable, generally with colors in the blue and purple range indicating low values, green and yellow indicating intermediate values, and oranges and reds indicating high values. Many of the early data visualizations that used false color palettes used the rainbow palette. A classic example is phytoplankton pigment concentration maps generated with Coastal Zone Color Scanner data. As a result, the rainbow palette has become ubiquitous for data mapping.

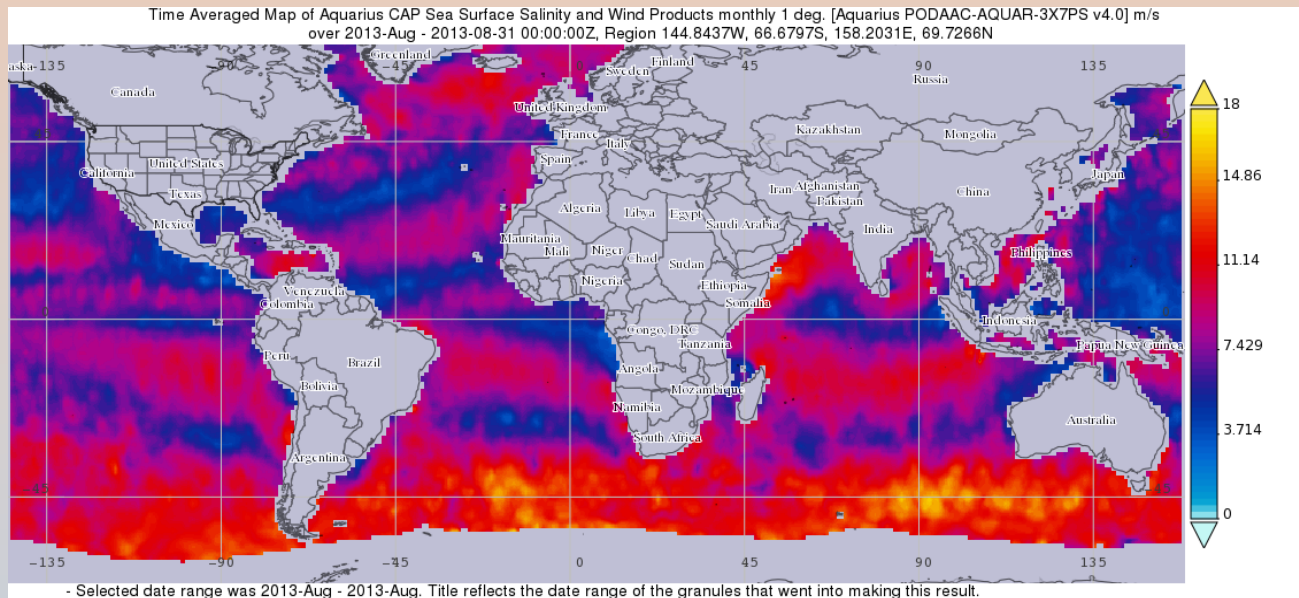
There is one particular problem with the use of the rainbow palette; visually, it’s not a very good palette.

There are many reasons for the previous statement, which won’t be discussed here. (For more about this, we suggest reading the article [“Why rainbow colors aren’t the best option for data visualizations.”](#)) However, there is one particularly interesting reason the rainbow palette is deemed deficient, and that is the color yellow, which in the rainbow palette indicates intermediate values, is actually the brightest color perceived by human eyes in the visible spectrum. The increased contrast that yellow provides makes it a good choice for the highest values shown in a data map, highlights where they occur, and distinguishes them from the other values. (This does assume that the highest values, rather than the lowest values, are of interest, which may not always be true.)

Giovanni has a palette where yellow is the “top color,” which is called the “Cyan-Red-Yellow” palette. It has 65 color shades. The lowest values are indicated with a fairly bright shade of light blue, while the highest values are indicated with yellow. Here’s an example, with the normalized fluorescence light height parameter (nFLH) for the waters around southern Africa. The highest values of nFLH indicate thriving phytoplankton populations, and the lowest values indicate water with very low phytoplankton activity. This palette makes both of those conditions quite easy to see.



Another example is this global map of wind speed from the Aquarius mission, for August 2013. The high winds around Antarctica in winter, and the low wind speeds in the equatorial doldrums and the horse latitudes (30-38 degrees north and 30-38 degrees south), are well visualized.



There are many other color palettes in Giovanni-4. Some of them are specialized, such as the one that lends “natural” colors to depictions of the Normalized Difference Vegetation Index (NDVI). We invite you to try them out. We’ll be offering more palette guidance both in the site’s Help documentation and in *The Giovanni News* in the near future.